

a 'most welcome addition,' to the stratigraphy of the Taconic range, of two plates of stratigraphical sections' by Professor Hall, 'prepared by him forty to forty-five years since.'

Those two plates, or rather five plates, for that is their exact number, were freely distributed by Professor Hall as far back as Lyell's second visit to America, 1845-46, and are well known on both sides of the Atlantic.

Professor Emmons refers to them in one of his letters, dated Raleigh, N.C., Dec. 28, 1860, of which I published an extract in 'The Taconic system and its position in stratigraphic geology' (*Proc. Amer. acad. arts and sciences*, vol. xii. p. 128, Cambridge, 1885), as follows: "You are aware that [Professor] Hall prepared five long sheets of sections illustrating his views, and which extended from the Helderberg to the Connecticut River, and from the Lake Champlain to the Connecticut valley. . . . They were designed to sustain his peculiar views. I have copies, and I wish you had them. They are curiosities in their way."

It is evident that the views entertained by Professor Hall, contesting the conclusions of Dr. Emmons, have been placed before geologists in the United States, Canada, and Europe since the appearance of 'The Taconic system' in 1842.

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Cambridge, Mass., April 23.

#### A carnivorous butterfly larva.

One of the most interesting of our butterflies is that known as *Fenesica tarquinius*, — a unique lychnid having the wings above brown-black in color, with conspicuous orange markings both on primaries and secondaries. It has a wide geographical range, occurring very generally over North America, as also in Asia.

Donovan, in his 'Insects of India' (pl. xlv. fig. 1), illustrates the butterfly rather poorly, but says nothing about the larva; Boisduval and LeConte (*Hist. des lep. et des chen. de l'Amer. Sept.*, p. 128, pl. 37) figure the larva, pupa, and imago under the name of *Polyommatus crataegi*, and simply quote Abbot as stating that the larva lives in several species of *Crataegus*; Scudder (*Proc. Essex inst.*, iii. p. 163, 1862) treats of it under the name of *Polyommatus porsenna* (*Syn. list of Amer. rurales*, Bull. Buff. soc. nat. hist., iii. p. 129, May, 1876), giving the food-plants of the larva as *Alnus*, *Ribes*, *Vaccinium*, and *Viburnum* (later, in the *American naturalist* for August, 1869, he gives the food-plants as follows, — 'probably arrow-wood, elder, and hawthorn'); Grote (*Trans. Amer. ent. soc.*, ii. p. 307) first proposed the generic name of *Fenesica*, but says nothing about its larval history; Strecker (*Butt. and moths*, etc. — Diurnes, p. 103) repeats simply from Scudder; while William H. Edwards, in his admirable life-histories of butterflies, has not, so far, treated of this particular species. In short, so far as the published records go, it has been generally assumed that the larva feeds upon the plants named.

The object of this brief communication is to show that in this larva we have one that is truly carnivorous, — a fact which is extremely interesting, because, so far as I can find, there is not another recorded carnivorous butterfly larva; and Mr. Scudder, who has given great attention to the butterflies, writes me in a recent letter, in reply to an inquiry on this point,

that he cannot recall any mention of such. Quite a number of heterocerous larvae are known to be carnivorous by exception, and not a few are so as a rule. These are chiefly found among pyralids; and it is not necessary, for my present purpose, to refer to the cases in detail.

For some years, now, I have been studying the remarkable life-habits of the Aphididae, and especially of some of the gall-making and leaf-curling species of Pemphiginae.

In collecting material and making observations, I have been assisted by Mr. Th. Pergande, who has, on a number of occasions since 1880, found the larva of this *Fenesica* associated with various plant-lice. Among the species with which it has been thus found associated are *Pemphigus fraxinifolii* Riley, which curls the leaves of *Fraxinus*; *Schizoneura tessellata* Fitch, which crowds upon the branches of *Alnus*; and *Pemphigus imbricator* Fitch, which congregates in large masses on *Fagus*. All these species produce much flocculent and saccharine matter.

The frequency with which this larva was found among these plant-lice justified the suspicion that it feeds upon them or derives benefit from them; yet up to 1885 the presumption was that it benefited from the secretions of the plant-lice rather than from the insects themselves. Last fall, however, Mr. Pergande obtained abundant evidence that the *Fenesica* larva actually feeds upon the aphids, and I thought it worth while to call attention to this positive proof of the carnivorous habits of the species. That the different species of plant-lice are the normal food of this larva, is rendered more than probable for the following reasons: —

1. Attempts to feed the larva upon the leaves upon which it was found have proved futile, the larva perishing rather than feed upon them.

2. The food-plants given by the authorities are such as are well known to harbor plant-lice.

3. Mr. Scudder's authorities, as he informs me, were picked up here and there; and one of them for alder, which he recalls, 'found it more commonly on a limb among plant-lice.'

4. Mr. Otto Lugger has frequently observed the larva around Baltimore among *Pemphigus imbricator* on beech, but never disassociated from the lice; and Judge Lawrence Johnson also found it in connection with the same species around Shreveport, La., last fall, and surmised that it might feed upon the *Pemphigus*; but neither of these observers were able to get positive proof of the fact.

C. V. RILEY.

#### Combined aerial and aquatic respiration.

In investigating combined aerial and aquatic respiration in vertebrates, the following questions have presented themselves for solution, — questions which, so far as we have been able to ascertain, have not been previously answered by physiologists: —

1. Is the aerial part of the respiration like that of animals with an exclusively aerial respiration?

2. Is the aquatic part of the respiration like that of animals with an exclusively aquatic respiration?

In answer to these questions, we offer the following facts and conclusion: —

1. Observations upon the aquatic respiration of soft-shelled turtles (*Science*, vi. p. 255; and *Amer. nat.*, 1886, p. 233) showed that the air taken from the lungs of a turtle that had been immersed several hours, had been almost completely deprived of its